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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/599,875	10/12/2006	Bruce C.B. Chan	LDEI-102/PCT/US	5938

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EXAMINER

FEELY, MICHAEL J

ART UNIT	PAPER NUMBER
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1796

MAIL DATE	DELIVERY MODE
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04/29/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/599,875	Applicant(s) CHAN ET AL.	
	Examiner Michael J. Feely	Art Unit 1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 October 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4, 10-19, 22, 23, 28, 29, 34 and 36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 10-19, 22, 23, 28, 29, 34 and 36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Pending Claims

Claims 1-4, 10-19, 22, 23, 28, 29, 34, and 36 are pending.

Information Disclosure Statement

1. The listing of references in the Search Report is not considered to be an information disclosure statement (IDS) complying with 37 CFR 1.98. 37 CFR 1.98(a)(2) requires a legible copy of: (1) each foreign patent; (2) each publication or that portion which caused it to be listed; (3) for each cited pending U.S. application, the application specification including claims, and any drawing of the application, or that portion of the application which caused it to be listed including any claims directed to that portion, unless the cited pending U.S. application is stored in the Image File Wrapper (IFW) system; and (4) all other information, or that portion which caused it to be listed. In addition, each IDS must include a list of all patents, publications, applications, or other information submitted for consideration by the Office (see 37 CFR 1.98(a)(1) and (b)), and MPEP § 609.04(a), subsection I. states, "the list ... must be submitted on a separate paper." Applicant is advised that the date of submission of any item of information or any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the IDS, including all "statement" requirements of 37 CFR 1.97(e). See MPEP § 609.05(a).

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Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-3, 10, 11, 22, 28, 29, 34, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al. (US Pat. No. 6,180,696).

Regarding claims 1-3, 10, 11, 22, 28, 29, 34, and 36, Wong et al. disclose: **(1, 28, 29)** a method *of formulating* an under-fill formulation in the presence of flux, flux residues and/or reaction products thereof (Abstract; column 13, lines 5-27), said method comprising adding an effective amount (column 14, lines 52-60) of one or more cationic catalyst(s) to said under-fill formulation (Abstract; column 11, lines 50-60; column 12, line 57 through column 13, line 4);

(2) wherein the under-fill formulation comprises one or more curable resins and the one or more cationic catalyst(s) (Abstract; column 6, line 20 through column 11, line 15); **(3)** wherein the under-fill formulation further comprises filler (Abstract; column 5, lines 48-67); **(10)** wherein the under-fill formulation further comprises at least one curing agent (Abstract; column 11, lines 16-50);

(11) wherein the cationic catalyst is an onium salt (column 12, line 57 through column 13, line 4);

(22) wherein the curable resin is selected from the group consisting of epoxy resins, phenol resins, maleimide resins, itaconamide resins, nadimide resins, (meth)acrylate resins,

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polyamide resins, polyimide resins, cyanate ester resins, and combinations of any two or more thereof (Abstract; column 6, line 20 through column 11, line 15);

(34) a method for adhesively attaching an electronic component to a circuit board (Abstract; column 4, lines 7-9; column 1, lines 29-67) in the presence of flux, flux residues and/or reaction products thereof (Abstract; column 13, lines 5-27), the method comprising curing a composition comprising one or more curable resins and one or more cationic catalyst(s) (Abstract; column 11, lines 50-60; column 12, line 57 through column 13, line 4) after application of the composition between the component and the board (Abstract; column 4, lines 7-9; column 1, lines 29-67); and

(36) an article comprising an electronic component adhesively attached to a circuit board (Abstract; column 4, lines 7-9; column 1, lines 29-67) in the presence of flux, flux residues and/or reaction products thereof (Abstract; column 13, lines 5-27), wherein the electronic component is adhesively attached to the board by a cured aliquot of a composition comprising one or more curable resins and one or more cationic catalyst(s) (Abstract; column 11, lines 50-60; column 12, line 57 through column 13, line 4).

Wong et al. disclose a number of curing accelerators, such as alkyl substituted imidazole, triphenylphosphine, imidazolium salts, *onium-borate compounds*, metal chelates, and mixtures thereof (*see column 11, lines 50-60; column 12, line 57 through column 13, line 4*). In light of this relatively small list of accelerator options, the use of a cationic accelerator (catalyst), and particularly an onium salt, would have been obviously envisaged by the skilled artisan at the time of the invention.

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Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a cationic accelerator (catalyst), such as an onium salt, in the under-fill formulation of Wong et al. because Wong et al. disclose a relatively small list of accelerator options including onium-borate salts.

It should be further noted that the teachings of Wong et al. fail to explicitly disclose: *(1 & 28) a method for improving or an improvement of: flux compatibility of an under-fill formulation in the presence of flux, flux residues and/or reaction products thereof; and (29) a method for improving HAST performance of an under-fill formulation in the presence of flux, flux residues and/or reaction products thereof, wherein the effective amount of catalyst improves the HAST performance of the under-fill formulation.* However, it appears that these improvements would have been inherently satisfied by the teachings of Wong et al. because the obvious embodiments of Wong et al. satisfy all of the material/chemical limitations of the instant invention.

In light of this, it has been found that, “Products of identical chemical composition can not have mutually exclusive properties.” A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present – *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

Therefore, it appears that the teachings of Wong et al. would have inherently satisfied the instantly claimed *improvements* because the obvious embodiments of Wong et al. satisfy all of the material/chemical limitations of the instant invention.

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4. Claims 1-4, 10, 11, 22, 23, 28, 29, 34, 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shah (US 2004/0087681 A1).

Regarding claims 1-4, 10, 11, 22, 23, 28, 29, 34, and 36, Shah discloses: **(1, 28, 29)** a method *of formulating* an under-fill formulation in the presence of flux, flux residues and/or reaction products thereof (Abstract; paragraphs 0010 & 0014), said method comprising adding an effective amount (paragraphs 0019-20) of one or more cationic catalyst(s) to said under-fill formulation (Abstract; paragraph 0015);

(2) wherein the under-fill formulation comprises one or more curable resins and the one or more cationic catalyst(s) (Abstract; paragraphs 0011-0012); **(3)** wherein the under-fill formulation further comprises filler (Abstract; paragraph 0017); **(4)** wherein the under-fill formulation further comprises core-shell rubber (Abstract; paragraph 0017); **(23)** wherein the core-shell rubber is selected from the group consisting of *see claim for list* (Abstract; paragraph 0017); **(10)** wherein the under-fill formulation further comprises at least one curing agent (Abstract; paragraphs 0013-0014 & 0016);

(11) wherein the cationic catalyst is an onium salt (paragraph 0015);

(22) wherein the curable resin is selected from the group consisting of epoxy resins, phenol resins, maleimide resins, itaconamide resins, nadimide resins, (meth)acrylate resins, polyamide resins, polyimide resins, cyanate ester resins, and combinations of any two or more thereof (Abstract; paragraphs 0012-0013);

(34) a method for adhesively attaching an electronic component to a circuit board (Abstract; paragraphs 0001-0008) in the presence of flux, flux residues and/or reaction products thereof (Abstract; paragraphs 0010 & 0014), the method comprising curing a composition

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comprising one or more curable resins and one or more cationic catalyst(s) (Abstract; paragraph 0015) after application of the composition between the component and the board (Abstract; paragraphs 0001-0008);

(36) an article comprising an electronic component adhesively attached to a circuit board (Abstract; paragraphs 0001-0008) in the presence of flux, flux residues and/or reaction products thereof (Abstract; paragraphs 0010 & 0014), wherein the electronic component is adhesively attached to the board by a cured aliquot of a composition comprising one or more curable resins and one or more cationic catalyst(s) (Abstract; paragraph 0015).

Shah discloses a number of curing accelerators, such as CURIMID-DN, AMICURE 2PIP, alkyl substituted imidazole, triphenylphosphine, imidazolium salts, imidazole phosphate, imidazole salts, **onium-borate**, metal chelates, and mixtures thereof (*see paragraph 0015*). In light of this relatively small list of accelerator options, the use of a cationic accelerator (catalyst), and particularly an onium salt, would have been obviously envisaged by the skilled artisan at the time of the invention.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a cationic accelerator (catalyst), such as an onium salt, in the under-fill formulation of Shah because Shah discloses a relatively small list of accelerator options, including onium-borate salts.

It should be further noted that the teachings of Shah fail to explicitly disclose: **(1 & 28)** a method *for improving* or *an improvement of*: flux compatibility of an under-fill formulation in the presence of flux, flux residues and/or reaction products thereof; and **(29)** a method *for improving* HAST performance of an under-fill formulation in the presence of flux, flux residues

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and/or reaction products thereof, wherein the effective amount of catalyst improves the HAST performance of the under-fill formulation. However, it appears that these improvements would have been inherently satisfied by the teachings of Shah because the obvious embodiments of Shah satisfy all of the material/chemical limitations of the instant invention.

In light of this, it has been found that, “Products of identical chemical composition can not have mutually exclusive properties.” A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present – *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

Therefore, it appears that the teachings of Shah would have inherently satisfied the instantly claimed *improvements* because the obvious embodiments of Shah satisfy all of the material/chemical limitations of the instant invention.

5. Claims 12-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al. (US Pat. No. 6,180,696) or Shah (US 2004/0087681 A1) in view of Rubinsztajn et al. (US 2004/0101688 A1).

Regarding claims 12-19, the teachings of Wong et al. and Shah are as set forth above and incorporated herein. Both references disclose the use of onium salts (*see onium borate*) with a generic onium cation; however, these references fail to disclose the limitations set forth in claims 12-19.

Rubinsztajn et al. disclose a similar under-fill formulation (*see Abstract; paragraphs 0001-0011*). As set forth in Wong et al. and Shah, Rubinsztajn et al. disclose the use of an epoxy

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resin based formulation (*see Abstract; paragraphs 0012-0018*) featuring an anhydride curing agent (*see Abstract; paragraphs 0033-0034*) and a cationic accelerator (*see paragraph 0032*).

They disclose a cationic accelerator:

- **(12)** wherein the cationic catalyst is selected from the group consisting of *see claim for list (see paragraph 0032)*;
- **(13)** wherein the cationic catalyst is a diaryl-iodonium salt or a triaryl-sulfonium salt (*see paragraph 0032*);
- **(14)** wherein the cationic catalyst is a diaryl-iodonium salt having the formula *see claim for structure (see paragraph 0032)*; **(15)** wherein An^- is selected from the group consisting of *see claim for list (see paragraph 0032)*;
- **(16)** wherein the cationic catalyst is a triaryl-sulfonium salt having the formulae *see claim for structure (see paragraph 0032)*; **(17)** wherein An^- is selected from the group consisting of *see claim for list (see paragraph 0032)*;
- **(18)** wherein the cationic catalyst is selected from the group consisting of (4-octyloxy-phenyl)phenyl-iodonium hexafluoroantimonate, [4-(2-hydroxy-1-tetradecyloxy)phenyl]phenyl-iodonium hexafluoroantimonate, 4-(2-hydroxy-tetradecyloxyphenyl)phenyl-iodonium hexafluoroantimonate, and combinations of any two or more thereof (*see paragraph 0032*); **(19)** wherein the cationic catalyst is 0.1-10 wt % of said under-fill formulation (*see paragraph 0032*).

These teachings demonstrate that antimonate counter-ions, such as hexafluoroantimonate, and borate counter-ions, such tetrakis(pentafluorophenyl)borate, are recognized in the art as equivalent counter-ions for onium salt catalysts – *see MPEP 2144.06*. This is

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particularly the case when they are used in concert with an epoxy resin and an anhydride curing agent. Furthermore, these teachings demonstrate that the instantly claimed iodonium and sulfonium cations are recognized in the art as suitable onium cations for onium salt catalysts used in concert with an epoxy resin and an anhydride curing agent. In light of this, it has been found that the selection of a known material based on its suitability for its intended use supports a *prima facie* obviousness determination – see *MPEP 2144.07*.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the instantly claimed onium salt catalysts, as taught by Rubinsztajn et al., in the under-fill formulations of Wong et al. or Shah because: (a) the teachings of Rubinsztajn et al. demonstrate that antimonate counter-ions, such as hexafluoro-antimonate, and borate counter-ions, such tetrakis(pentafluorophenyl)borate, are recognized in the art as equivalent counter-ions for onium salt catalysts, particularly when they are used in concert with an epoxy resin and an anhydride curing agent; and (b) the teachings of Rubinsztajn et al. demonstrate that the instantly claimed iodonium and sulfonium cations are recognized in the art as suitable onium cations for onium salt catalysts used in concert with an epoxy resin and an anhydride curing agent.

6. Claims 4 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al. (US Pat. No. 6,180,696) in view of Shah (US 2004/0087681 A1).

Regarding claims 4 and 23, the teachings of Wong et al. and Shah are as set forth above and incorporated herein. Wong et al. disclose that *toughening agents* can be added to their formulation (*see column 14, lines 27-32*); however, they fail to explicitly disclose: **(4)** wherein

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the under-fill formulation further comprises core-shell rubber; and (23) wherein the core-shell rubber is selected from the group consisting of *see claim for list*.

The teachings of Shah demonstrate that the instantly claimed core-shell materials are recognized in the art as suitable toughening agents for this type of under-fill formulation (*see paragraph 0017*). In light of this, it has been found that the selection of a known material based on its suitability for its intended use supports a *prima facie* obviousness determination – *see MPEP 2144.07*.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the instantly claimed core-shell materials, as taught by Shah, in the under-fill formulation of Wong et al. because the teachings of Shah demonstrate that the instantly claimed core-shell materials are recognized in the art as suitable toughening agents for this type of under-fill formulation.

Claim Objections

7. Claim 23 is objected to because of the following informalities: claim 23 should be dependent from claim 4 – not claim 3. Appropriate correction is required.

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Communication

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J. Feely whose telephone number is (571)272-1086. The examiner can normally be reached on M-F 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Y. Pyon can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Michael J Feely/
Primary Examiner, Art Unit 1796

April 27, 2009